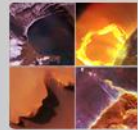


A vibrant cosmic background image showing a complex nebula with glowing blue, orange, and purple gas clouds, interspersed with numerous bright stars.

Princeton Astrophysics Community Meeting

Astrophysics

Michael Moore
Program Executive
Astrophysics Division
Science Mission Directorate
September 4, 2012



Timeline

- 2011
 - 10 January: Identification of hardware availability by the NRO
 - 20 January: Initial establishment of task to study use of the system
 - Summer study presentations to senior staff
 - 19 August: 3-party MOU signed
 - 29 August: DD1149 signed
 - 30 August: NASA SMD (Morse/Moore) visit to ITT/Exelis Rochester for informal “handoff”
 - 11 November: Property assigned to JPL subcontract 1377681
 - 15 November: Desensitization of hardware initiated
- 2012
 - 21 February: Desensitization Security Review
 - 1 March: Desensitization complete
 - 1 March: Units 1 & 2 mirror coatings inspection report complete
 - 11 May: Preliminary technical data was provided to prospective NASA science users
 - 4 June: Hertz “New Developments in Astrophysics” presentation to the Committee on Astronomy and Astrophysics; A. Dressler presents on “Implications of New Developments for the Decadal Survey”
 - 12 June: At the Anchorage AAS, Grunsfeld challenged American astronomers to consider exciting applications for this hardware
 - 17 July: CAA Chair D. Spergel announced a community workshop at Princeton scheduled for September 4-6 on the scientific uses of the telescopes (**not** a NASA activity!)
 - 27 July: NASA Advisory Council elects to forward a recommendation to the NASA Administrator that a study be conducted on potential uses of the telescope assets
 - 30 July: Moore “2.4m Telescopes” presentation to the NAC subcommittee on Astrophysics
 - 13 August, the NASA SIP meeting gives guidance to the Agency



Administrator Guidance from SIP Meeting

Specific Guidance and Forward Work

SMD will lead a broad study to assess a range of potential uses of these assets across SMD portfolio including Heliophysics, Planetary Science, and Astrophysics beyond the Decadal priorities to include NASA strategic priorities. These include integration with HEOMD and Space Technology as active partners, taking into account higher risk mission architectures, advanced technologies, and lower cost.

SMD will also proceed to conduct a focused mission concept study to identify potential uses of telescope assets to meet Astrophysics scientific priorities and assess financial requirements.

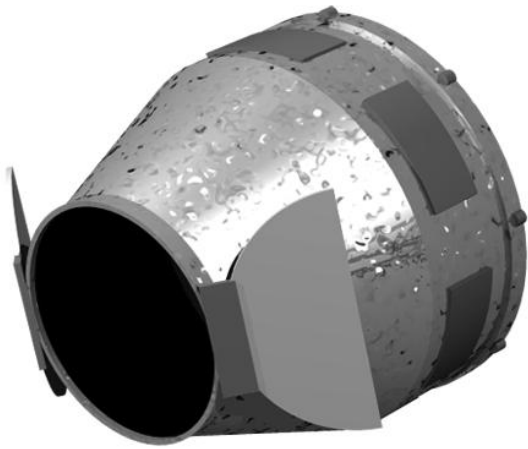
Inputs from the Princeton external Workshop scheduled for September 2012 will be considered and factored into the future planning of the SMD-sponsored external workshop.

Both studies will be completed by approximately April 2013 and will employ reasonable budget assumptions coordinated with OCFO. These studies will inform an eventual decision on the future of the assets and a possible mission that may follow JWST.

Action: SMD to provide periodic updates on the status of the studies to the Administrator.



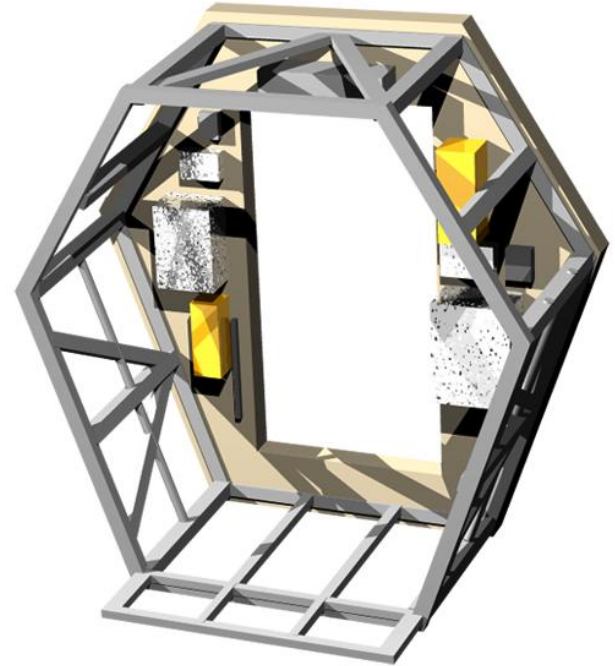
What Is the Hardware Being Considered?



Outer Barrel Assembly
2



Fore Optics Assembly
2 (and an extra Primary)



Structural Support Elements

And lots of little elements and the design and test data.



What Fraction of a Mission is This Hardware?

- A typical Astrophysics imaging telescope system has 5 parts of roughly equal cost:
 1. Telescope – usually the Primary and secondary mirror with the metering truss and focal plane structure (where the instruments live). This is what we have for “free”; cost avoidance of approx. \$250M
 2. Spacecraft – includes the pointing and control, data systems, thermal control, communications and other utility elements.
 3. Instruments – These can be one or more, depending on the design and teaming, but on HST they have run about \$200M each.
 4. Launch vehicle – This can be pretty hard to guess but a small EELV should be assumed
 5. Operations - Ground control, science center and scientific research funding.



Current Status

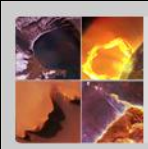
- ✧ The hardware, support equipment, documentation and records are in Rochester at the ITT-Exelis facility.
 - While the elements have been declassified, there are still issues relating to ITAR and other sensitivities that limit our ability to share detailed information widely.

- ✧ Following their July meeting, the NASA Advisory Council will be recommending NASA study the use of the telescope assets including how they could be utilized by any of the four SMD science disciplines.



Early Study Activity Indications

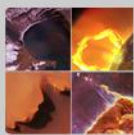
- ✧ A preliminary NASA multi-center study was accomplished within the confines of the security classification to ensure the assets had substantial value to future science. This effort focused on the science identified in the Astrophysics Decadal Survey and provided a necessary “sanity check” about the performance and potential costs related to one design solution.
- ✧ A quick, cursory examination by external scientists was accomplished using a very limited set of optical performance data to identify some potential science capacities. Their impressions were reported to the NRC Committee on Astronomy & Astrophysics.



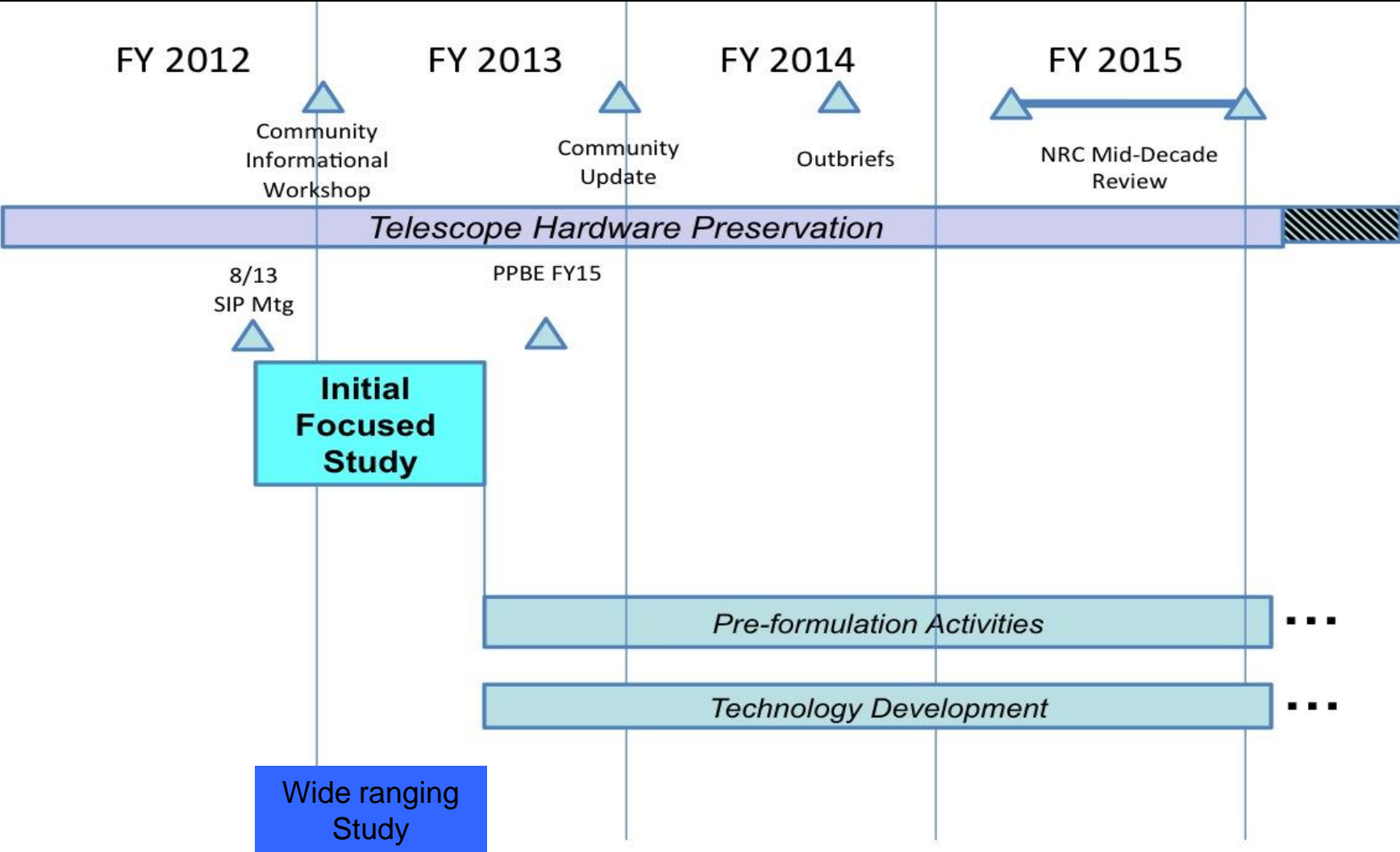
NRC Astrophysics Decadal Survey Recommendations for Space Missions

	Name ¹	Target Launch Year	
	Wide Field Infrared Space Telescope (WFIRST)	2020	Design Reference Mission completed; candidate for mission after JWST
	Explorer Program Augmentation	Ongoing	Currently included within Astrophysics PPBE14 in-guide budget request.
	Laser Interferometry Space Antenna (LISA)	~2025	Mission non-selected by ESA. Must consider alternative mission to achieve science.
	International X-ray Observatory (IXO)	(late-)2020s	Mission non-selected by ESA. Must consider alternative mission to achieve science.
Medium	New Worlds Technology Development Program	For a mission in the 2020s	Funding for technology development included within Astrophysics PPBE14 in-guide budget request.
	Inflation Probe Technology Development Program	For a mission in the 2020s	Funding for technology development included within Astrophysics PPBE14 in-guide budget request.
Small	US instrument for int'l Space Infrared telescope for Cosmology and Astrophysics (SPICA)	2018 in Survey; likely 2020s	No funding included within Astrophysics PPBE14 in-guide budget request; possibility for mission of opportunity selection through future AO.
	Definition of 4-m Hubble replacement	Late-2020's+	Funding for technology development included within Astrophysics PPBE14 in-guide budget request.

RED = Where Astrophysics sees Potential Applicability for the Telescope Assets



Notional Schedule & Milestones





Closing Thoughts

Initial looks at a typical development project with a couple of “generic” instruments seems to run near \$1.75B.

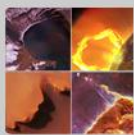
At this cost level, we are sure not to get a start till the JWST costs begin to roll off in 2017 (if then). That assumes that Astrophysics gets the use of those funds if they become available.

Since the telescope assets come to us as-is and free, it seems inappropriate to use first quality new hardware to develop a science driven system that costs as much as a new (if somewhat smaller) mission capability.

Another intellectual approach might be to see what can be done with heritage hardware and spares from other missions and focus on what can be done for science at the lowest price. Maybe even with some reduced reliability.

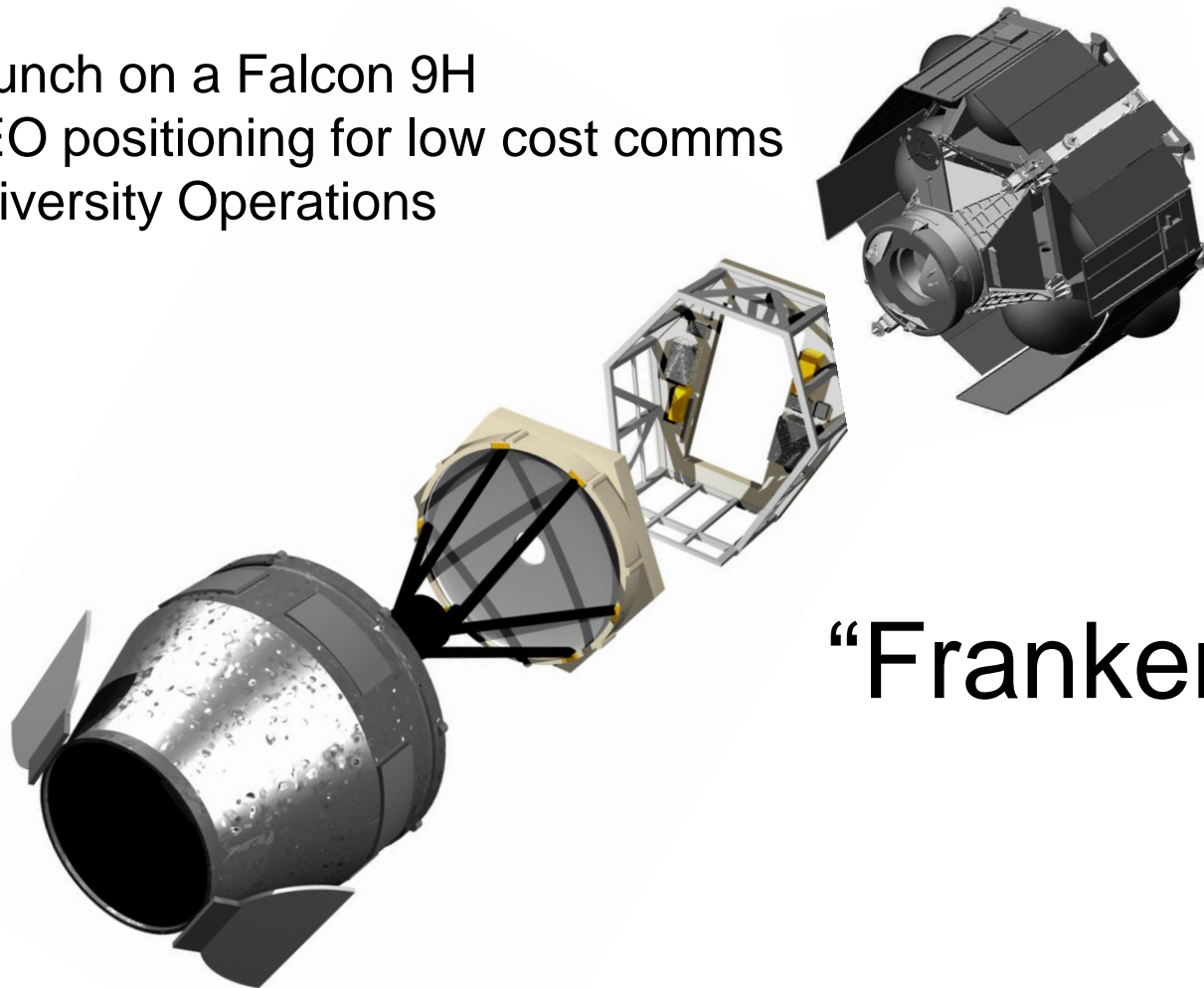
If the community can't innovate through this period, the opportunity to have another mission of any scale before the mid 2020's will be very limited, with all the negative impacts we can easily predict.

Back-up



Using the ICM?

Launch on a Falcon 9H
GEO positioning for low cost comms
University Operations

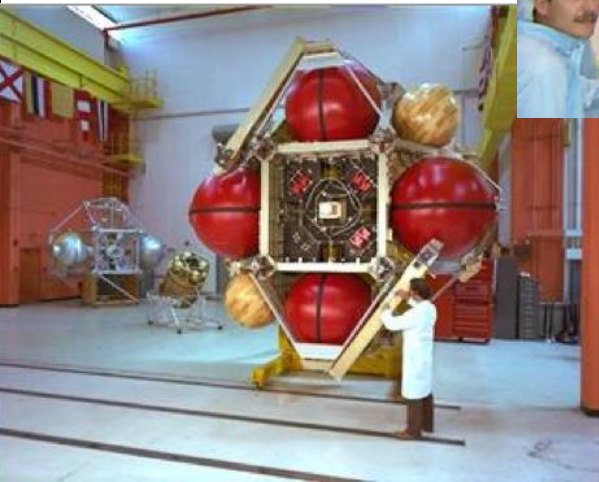
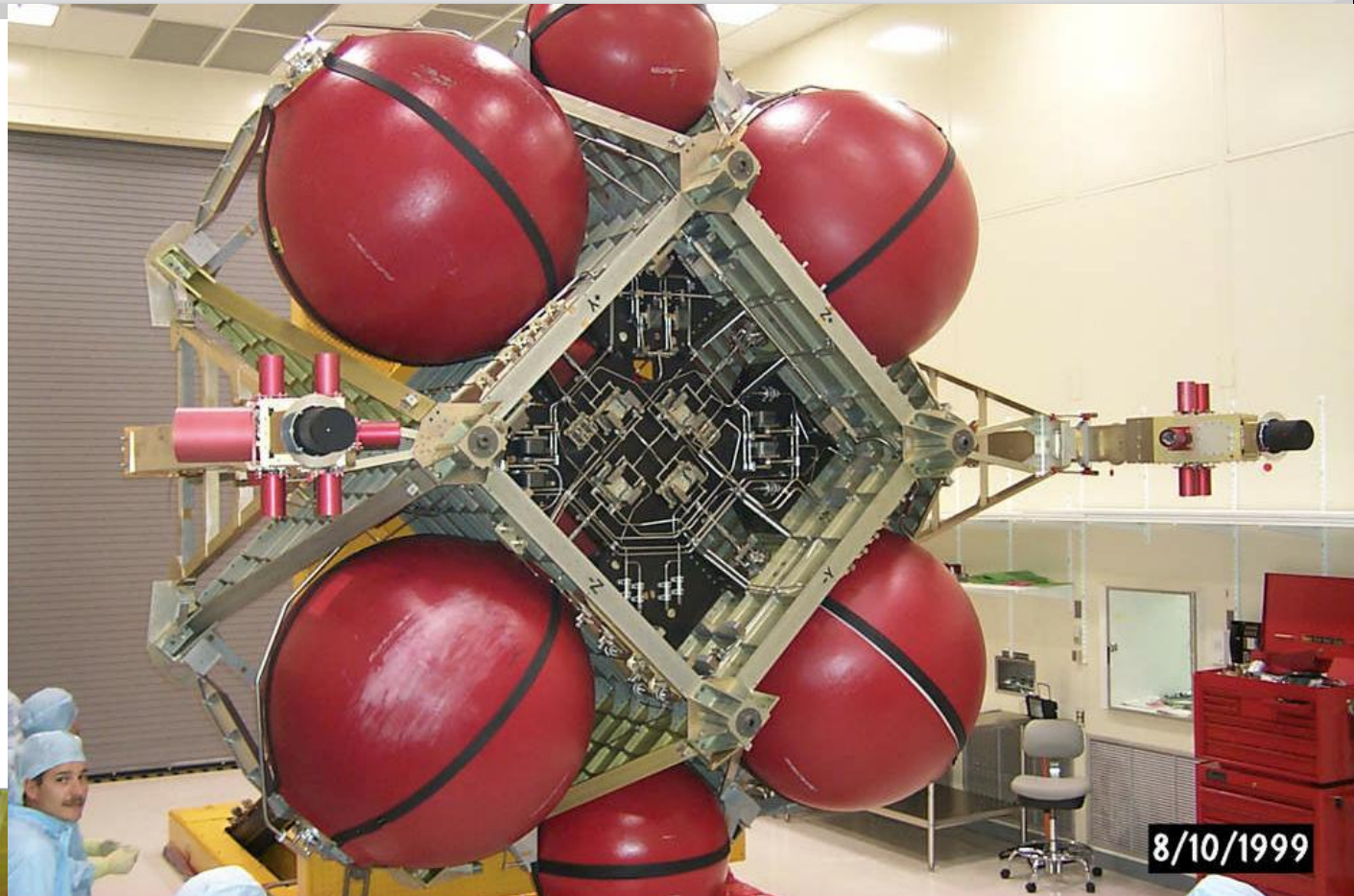


“Frankenscope”

Kodos to R. Capps



There are *Leftover* Spacecraft Around!



NRL's Interim Control Module (ICM) was Modified for the ISS and is still in storage